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The degree of the epigenetic transformation of an organic matter in the Early Carboniferous sediments of the central part of the Volga-Ural oil and gas province

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Abstract

The article deals with the issues of oil-bearing prediction. To assess the generation potential of source rock the transformation degree of organic matter (OM) is used. The most important criteria for the OM transformation degree is the value of vitrinite reflectance Ro. The sapropel is the most common OM in the oil-bearing strata. The determination of the Ro value is difficult there because of the complexity of detection and diagnostic of vitrinite components. The coal petrographic methods are considered to be the most reliable and accurate ones. We studied the degree of the epigenetic transformation of organic matter in terms of vitrinite reflectance Ro in coals in Visean deposits in Tatarstan. The Visean terrigenous stratum is distributed discretely within the domes of the North and South Tatar arch and interdome depressions. That is filling the depressions on the ancient surface of the Tournasian carbonate complex. The Visean oil-bearing stratum contains a large number of coal seams. The thickness of Visean coal seams can reach 30 m and more. The coal seams are common at the depths of 900-1400 m, plunging towards the south. It is found that the metamorphism of the coal regularly changes in different deposits mainly in the direction from north to south. Coal is mainly bituminous, sometimes subbituminous. According to Ro values the degree of epigenetic transformation of humus organic matter in the Visean coal deposits corresponds to the boundary of diagenesis and katagenesis. It is the upper part of the oil formations zone. The depth of coal seams and the variation in value of thermal field may be the cause of the heterogeneity of the coal metamorphism. Existing level of coal conversion in sediments may be reached by heating to 60 °C, which substantially exceeds the current temperature in the strata. So, temperatures at the depth of the Visean coal seams were in past higher than now. This is confirmed by characteristic features of the modern tectonic structure of the territory. The vertical deformation of coal seams relative to their original horizontal level testifies to the activism of the tectonic regime in the territory during the later geological epochs, which was accompanied by heat flows. The formation of oil deposits in the Early Carboniferous on the territory is a result of vertical migration of oil substances.

Keywords

Coal, Oil, The degree of metamorphism, Visean deposits, Vitrinite reflectance